

REMARKS

Claims 109-112, 115, 116, 119, 120, 123, 127 and 129-135 are pending. A marked-up version showing the changes made to the claims by the present amendment is attached hereto as **"Version with markings to show changes made."**

In the outstanding Office Action, the Examiner had commented that the phrase "the end portions of the protruding electrodes that protrude from the resin layer" in claim 119 is not provided with sufficient antecedent basis. However, claim 119 sets forth "so as to seal the protruding electrode except end portions thereof."

The claims have been amended to address the rejection under 35 USC §112, second paragraph. It is believed that the presently amended claims are in full compliance with 35 USC §112.

Claims 109-112, 131, 134 and 135 were rejected under 35 USC §102(e) as being anticipated by Yasunaga. It is respectfully submitted that the amended claims distinguish over Yasunaga. In this regard, amended claim 109 sets forth "said end portions protruding a height from the resin layer" and that "said bump having a height larger than said height of said protruding electrode protruding beyond said resin layer." Accordingly, Yasunaga does not anticipate the amended claims.

Claims 119 and 120 were rejected under 35 USC §103(a) as being unpatentable over Karnezos and Yasunaga. Favorable reconsideration of this rejection is earnestly solicited.

Claim 119 has been amended to specify that a part of said protruding electrode sealed by said resin layer and said end portion are covered with a common electrically conductive film.

In Fig. 4c of Karenzos, on the other hand, it is noted that the conductive film that is sealed by the insulator 42c is the conductor film 46c, while the conductor film formed on the end portion of the protruding electrode is the film 50c, which is a different film to the conductive film 46c.

The foregoing construction has merit as noted below.

When the protruding electrode is formed of a resilient resin core and a conductive film thereon as in the present invention, there arises a problem in that the protruding electrode tends to move slightly when mounted on a mounting substrate due to the stress from the mounting substrate. This problem does not appear when the protruding electrode is formed of a metal. As a result of this minute movement, there arises a problem that the conductive film 100 is detached from the resin layer 13 with time and a gap may be formed therebetween, even in the case where they have been intimately contacted at the time of production of the package. When this gap extends up to the surface of the resin layer 13, this provides a path for water in the environment to penetrate to the surface of the semiconductor chip 16 and to the conductive pad 97 on the chip surface.

Thus, in order to avoid this problem of penetration of water to the contact pad 97, the present invention uses the lead line 96 such that the contact pad 97 is formed with separation from the resin projection 99.

In the case of Karenzos in which a resin core 18c protrudes from a resin layer 42c, on the other hand, a void formed between the resin layer 42c and the conductive film 46c covering the sidewall of the resin core 18c is confined within the thickness of the resin layer 42c because of the fact that the conductive film 50c covering the resin core 18c is a film different from the conductive film 46c.

This means that the structure of Karnezos is inherently free from the problem of penetration of water to the contact pad 97, and thus, there is no motivation in Karnezos to use the lead line for securing distance between the protruding core and the contact pad.

Claims 123, 127 and 130 were rejected under 35 USC §102(b) as being anticipated by Nishino. This rejection is respectfully traversed.

The physical property of the material of the compression-molded layer is different than that of the resin layer of Nishino formed by spin-coating or squeeze printing, as shown in the prior response. Although the Examiner acknowledges that Nishino does not teach this feature, the Examiner argues that Nishino would inherently possess the structural characteristics. However, applicants have shown in the prior response that Nishino would not inherently possess the structural characteristics.

The structural differences were shown in the copy of IEEE Transactions on Advanced Packaging submitted with the prior response. The Examiner does not consider submission of this document to provide proof of the differences. Although the Examiner cites various court decisions, these decisions all relate to a lack of actual support or evidence. The document provided with prior response, however, serves as actual evidence of the structural differences.

Claims 132 and 133 were rejected under 35 USC §103(a) as being unpatentable over Hutson and McCann. Favorable reconsideration of this rejection is earnestly solicited.

Claim 132 has been amended to specify that the surface of the semiconductor element is formed with an electronic circuit and no electronic circuit is formed on the back surface semiconductor element.

In Fig. 7 of Hutson, a protective film of glass is formed on both surfaces of the element, while the glass protective film on both surfaces of the semiconductor element is provided for protecting the electronic circuits formed on both surfaces of the semiconductor element.


Thus, the present invention is distinct over Hutson in that no electronic circuit is formed on one of the surfaces of the semiconductor element, and that "a resin layer" is formed on the surface not formed with such an electronic circuit. It should be noted that the present invention employs such a construction in the purpose of relaxing stress caused as a result of differences of thermal expansion coefficient between silicon constituting the semiconductor element and the resin layer.

Prompt and favorable examination of the amended claims is earnestly solicited.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Enclosures: Version with markings to show changes made
Petition for Extension of Time

VERSION WITH MARKINGS TO SHOW CHANGES MADE (09/029,608)

IN THE CLAIMS:

Claims 109-111, 115, 119, 129 and 132 have been amended as follows:

109. (Three Times Amended) A semiconductor device comprising:
a semiconductor element having a surface on which protruding electrodes are formed;
a resin layer formed on the surface of the semiconductor element so as to seal the
protruding electrodes except end portions thereof, said end portions protruding a height from the
resin layer; and

external connection protruding electrodes provided to the end portions of the protruding
electrodes that protrude from the resin layer,

said external connection protruding electrodes forming a bump,

said bump having a height larger than [a] said height of said protruding electrode [for a
part thereof] protruding beyond said resin layer.

110. (Three Times Amended) The semiconductor device as claimed in claim 109,
wherein both a side portion of the resin layer and a side portion of the semiconductor element are
respectively exposed.

111. (Three Times Amended) A semiconductor device comprising:

a semiconductor element having a surface on which protruding electrodes having convex end portions are formed;

a resin layer formed on the surface of the semiconductor element so as to seal the protruding electrodes except the convex end portions thereof, said convex end portions protruding a height from the resin layer; and

external connection protruding electrodes provided to the convex end portions of the protruding electrodes that protrude from the resin layer,

said external connection protruding electrodes forming a bump,

said bump having a height larger than [a] said height of said protruding electrode [for a part thereof] protruding beyond said resin layer.

115. (Three Times Amended) A semiconductor device comprising :

a semiconductor element having a surface on which electrode pads connected to an internal part of the semiconductor element and protruding electrodes to be connected to an external part are formed;

lead lines each connecting one of the electrode pads and one of the protruding electrodes so that the protruding electrodes and the internal [pad] part are connected through the lead lines; and

a resin layer formed on the surface of the semiconductor element so as to seal the protruding electrodes except end portions thereof.

the protruding electrodes having a core portion and an electrically conductive film formed

on a surface of the core portion,

the core portions of the protruding electrodes are directly formed on the lead lines,
wherein the core portion comprises an elastic resin.

119. (Three Times Amended) A semiconductor device comprising:

a semiconductor element having a surface on which electrode pads connected to an internal part of the semiconductor element and protruding electrodes to be connected to an external part are formed;

lead lines each connecting one of the electrode pads and one of the protruding electrodes so that the protruding electrodes and the internal part are connected through the lead lines;

a resin layer formed on the surface of the semiconductor element so as to seal the protruding electrodes except end portions thereof which protrude from the resin layer; and

external connection protruding electrodes provided to the end portions of the protruding electrodes that protrude from the resin layer,

the protruding electrodes having a core portion and an electrically conductive film formed on a surface of the core portion,

the core portions of the protruding electrodes are directly formed on the lead lines,
wherein the core portion comprises an elastic resin, and

a part of said protruding electrode sealed by said resin layer and said end portion are covered commonly with said electrically conductive film.

129. (Twice Amended) The semiconductor device as claimed in claim [128] 127, wherein a side surface of the resin layer and a side surface of the semiconductor element are flush with each other.

132. (Amended) A semiconductor device characterized by comprising:
 a semiconductor element having protruding electrodes formed on a surface thereof;
 a first resin layer that is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof; and
 a second resin layer provided so as to cover at least a back surface of the semiconductor element,
 a sidewall surface of said semiconductor element being exposed at a sidewall surface of said semiconductor device,
wherein the surface of the semiconductor element is formed with an electronic circuit,
and wherein no electronic circuit is formed on a back surface of the semiconductor element.